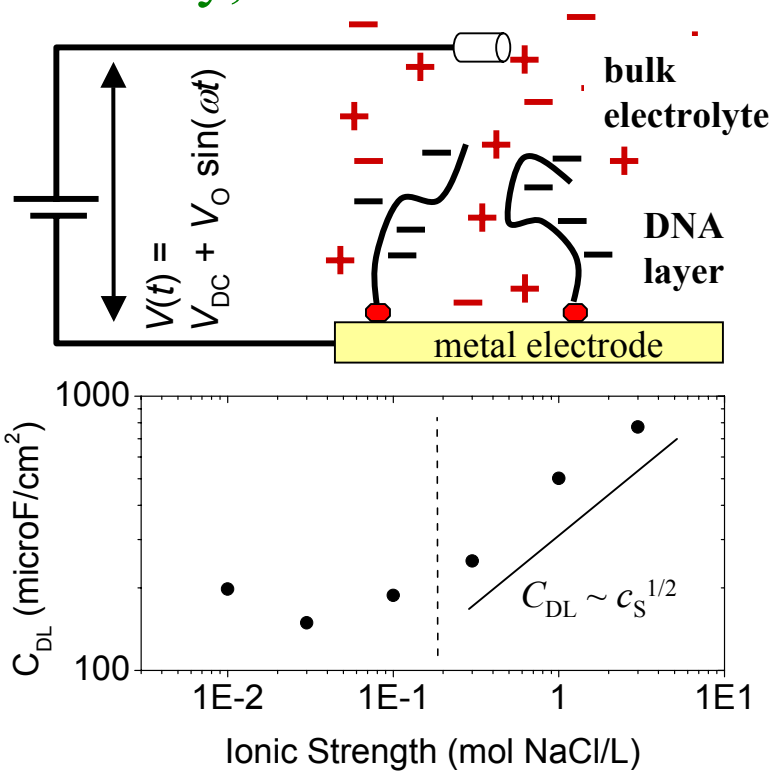
DNA Films as Model Polyelectrolytes and As Platforms for Biomolecular Diagnostics

Rastislav Levicky, Columbia University, DMR-0093758

Interfaces modified with charged polymers arise in applications as diverse as biosensing and colloidal processing, yet many aspects of their physical behavior remain puzzling. Layers of polymeric DNA, an anionic polyelectrolyte, are under study with combined techniques of interfacial capacitance measurement and neutron reflectivity to understand how ionic valency, surface electric fields, and geometry of attachment (chain length, surface density) influence layer organization and, consequently, layer function in diagnostic applications.

J. Am. Chem. Soc. (2004), in press.
Langmuir (2004), submitted.



Top. Capacitance of a surface modified with a polyelectrolyte layer is obtained by measuring current response to a small perturbing sinusoidal voltage. **Bottom**. When bulk ionic strength exceeds counterion density in the layer (dashed line), the capacitive response is consistent with Debye-Huckel predictions.

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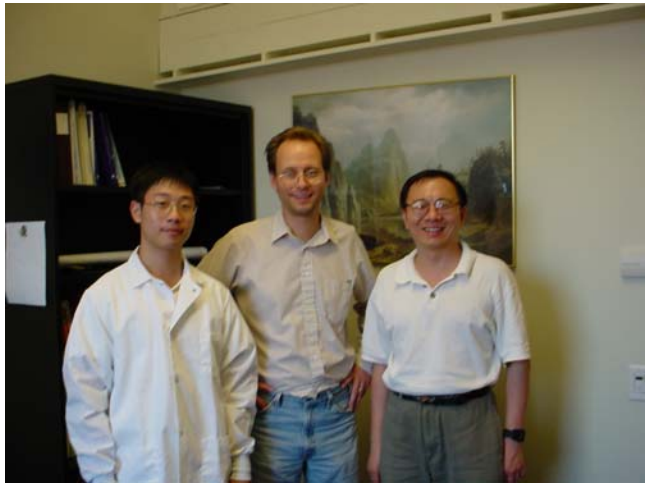
Education:

Two high school science teachers (Youning Wang, Murry Bergtraum High School; Robert Nociti, George Washington High School), two high school students (Alice Jia, Pei Da Guo), four undergraduates (Ana Acosta, Agnes Yeboah, Dan Okin, Susannah Dickerson), and three graduate students (Patrick Johnson, Youlei Weng, Gang Shen) contributed to research aspects of the project. From among the student participants, Ana Acosta enrolled in graduate school (MIT), Agnes Yeboah joined Bristol Myers Squibb, Patrick Johnson is pursuing postdoctoral research (Rutgers), and the rest are continuing their research at Columbia.



P.I (center) with high school summer research student Pei Da Guo (left) and high school science teacher Youning Wang (right), both from Murry Bergtraum High School in Manhattan, New York.